## Space Weather Forecast

Issued on Friday 13 December 2024 at 12:05 Local

**This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales**

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**Space Weather Forecast Headline: Minor/Moderate (R1/R2) radio blackouts likely throughout.**

**Analysis of Space Weather Activity over past 24 hours**

**Solar Activity:** Solar activity has remained Moderate, with four Moderate-class flares observed. The peak flare occurred at 12/1743UTC from a sunspot region in the southeast, and it was this group that produced almost all of the Moderate and upper Common-class activity of the period. Assessment as to this sunspot region's magnetic complexity carries lower confidence than is typical given the relatively lower resolution of terrestrial observatory-based imagery (versus unavailable space-borne imagery). This being said. the region appears to be magnetically bipolar with some 'sub-surface' complexity inferred. Many of the flares were accompanied by jet-like emissions in extreme UV imagery, however none of these has manifested as an Earth-directed Coronal Mass Ejection (CME).

There are now up to six sunspot regions on the Earth-facing side of the Sun, with a small new magnetically unipolar region appearing to the southeast of the largest sunspot in the southwest. The main changes in the period were for continued growth of the newly-numbered region in the south central part of the Sun, a continuation of the separation of the main spots in the northernmost group, and a tendency for the spots in the large southwestern region to agglomerate.

There remain no confirmed Earth-directed CMEs, however this assurance carries much lower confidence than usual given relatively few available satellite images, in part due to planned manoeuvres.

In addition to the aforementioned large jet-like emissions from the Moderate-class flares, the main CME candidates noted in the past 24 hours have been: firstly, a 'filament eruption' (arc of plasma) from near S10W030 at 12/2000UTC. Secondly, a 'prominence eruption' (arc of plasma on the Sun's edge) from the southwestern horizon at 12/2230UTC, shortly followed by a second possible disappearing filament in the southeast at 13/0220UTC, and finally a large but slower filament lift-off from S30E030 at 13/0700UTC.

This list is not exhaustive, but other emissions were smaller or else judged further from the Sun-Earth line. These events and CMEs are under review, although any impacts are felt most likely to be glancing - if present.

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**Solar Wind / Geomagnetic Activity:** Solar winds showed an ongoing slow wind regime. Solar wind speeds were at background, with the number of particles comprising the wind and their associated magnetic field both unremarkable and stable. The net result of these solar wind measures was for provisionally quiet geomagnetic activity throughout.

**Energetic Particles / Solar Radiation:** No solar radiation storms were observed.

**Four-Day Space Weather Forecast Summary**

**Solar Activity:** Moderate activity is likely, with isolated Moderate-class flares. There is a slight chance of Strong-class flares.

**Solar Wind / Geomagnetic Activity:** There are no confirmed Earth-directed CMEs as of the issue of this guidance.

Slow wind conditions are expected until a returning fast wind onset, most likely on Day 2 into Day 3 (14-15 December). Geomagnetic activity is expected to start mostly quiet as a result, then rising to give a slight chance of G1 Minor geomagnetic storm intervals. Activity may begin to ease into the new working week.

**Energetic Particles / Solar Radiation:** There is a daily slight chance of S1 minor solar radiation storms in response to any notable flares.

## Geomagnetic Storms

| Geomagnetic Storm | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|---|---|---|---|---|---|---|
| Probability (Exceedance) | | | (%) | (%) | (%) | (%) |
| Minor or Moderate | G1 to G2 | No | 1 | 10 | 20 | 1 |
| Strong | G3 | No | 1 | 1 | 1 | 1 |
| Severe | G4 | No | 1 | 1 | 1 | 1 |
| Extreme | G5 | No | 1 | 1 | 1 | 1 |

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## Radio Blackouts - X-Ray Flares

| X-Ray Flares | Level | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|---|---|---|---|---|---|---|
| Probability | | | (%) | (%) | (%) | (%) |
| Active | R1-R2 (M Class) | Yes | 70 | 65 | 60 | 60 |
| Very Active | R3-R5 (X Class) | No | 10 | 10 | 10 | 10 |

## Solar Radiation Storms (High Energy Protons)

| Radiation Storms | Level ($cm^{-2}sr^{-1}s^{-1}$) | Past 24 Hours (Yes/No) | Day 1 (00-24 UTC) | Day 2 (00-24 UTC) | Day 3 (00-24 UTC) | Day 4 (00-24 UTC) |
|---|---|---|---|---|---|---|
| Probability (Exceedance) | | | (%) | (%) | (%) | (%) |
| Active | ≥ S1 | No | 10 | 10 | 10 | 10 |
| Very Active | ≥ S3 * | No | 1 | 1 | 1 | 1 |
| * S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$) | | | | | | |

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